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Revision 0

Removal Action Work Plan for the Deactivation, Decontamination, Decommissioning, and Demolition of the Plutonium Finishing Plant Complex

Temporary Ventilation Exhauster Addendum

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
Richland, Washington 99352

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Temporary Ventilation Exhauster Addendum

W. G. Cox
CH2M HILL Plateau Remediation Company

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P.O. Box 550
Richland, Washington 99352

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Terms

CFM	cubic feet per minute
Ecology	Washington State Department of Ecology
HEPA	high efficiency particulate air
NESHAP	"National Emission Standards for Hazardous Air Pollutants" (40 CFR 61)
PFP	Plutonium Finishing Plant
PTE	Potential to Emit
RAWP	Removal Action Work Plan

1 Introduction

This addendum to the *Removal Action Work Plan for the Deactivation, Decontamination, Decommissioning, and Demolition of the Plutonium Finishing Plant Complex* (DOE/RL-2011-03) hereinafter called the Plutonium Finishing Plant (PFP) removal action work plan (RAWP), was prepared to provide information about temporary exhausters proposed for use during completion of work under the scope of the RAWP.

The Air Monitoring Plan (Section 4.3) of the PFP RAWP stipulates that if temporary exhausters that discharge directly to the atmosphere are to be used, descriptions of the units and proposed monitoring methods will be included as addendums to the PFP RAWP. This addendum contains the requisite information about two IONEX model 7559 exhausters. These units were previously utilized to support demolition activities in the 300 Area under DOE/RL-2004-77, *Removal Action Work Plan for 300 Area Facilities*.

2 Description of Temporary Exhausters

The two exhausters covered in this addendum are IONEX model 7559 exhausters and the descriptions provided herein apply to both. They will be referred to as IONEX 1 and IONEX 2.

These units are skid-mounted, filtered exhaust systems (Figure 1).

Figure 1. PFP Temporary IONEX Exhausters

Each unit is roughly 4.3 meters (14 feet) long by 3 meters (9 feet) wide and 3.4 meters (11 feet) tall including the rain hood on the outlet duct. Each unit includes four 46 centimeter (18 inch) outside diameter, flexible inlet duct connections, a bank of pre-filters, a bank of high efficiency particulate air (HEPA) filters, ducting and an exhaust fan. Each filter bank consists of 12 filters arranged three filters high by four across. Table 1 provides filter dimensions.

Table 1. Pre-filter and HEPA Filter Dimensions

	Height	Width	Depth
Pre-Filter	61 centimeters (24 inches)	61 centimeters (24 inches)	10.2 centimeters (4 inches)
HEPA Filter	61 centimeters (24 inches)	61 centimeters (24 inches)	29.2 centimeters (11.5 inches)

The HEPA filter bank will provide for an in-place testable efficiency of at least 99.95% for removal of test aerosol particulate when tested by a polydispersed liquid challenge aerosol that meets ASME AG-1-2012, Article TA-VI-3000. The exhaust outlet is 86.4 centimeters (34 inches) square and will exhaust at least 2 meters (7 feet) above grade. Each unit is equipped with differential pressure indicators across each bank of filter elements to monitor filter loading. Each unit is also equipped with a flow-monitoring element at the inlet of the fan connected to a local flow indicator. A copy of the IONEX model 7559 specification sheet has been included herein to provide additional detail (Figure 2).

2.1 Controls

Only HEPA filters rated at 1,500 cfm flow and certified by the manufacturer to meet at least 99.97% efficiency for 0.3 microns at rated flow and 20% of rated flow will be used.

HEPA filters will have in-place leak tests performed each time new filters are installed, prior to initial use at PFP and on an annual basis thereafter. The differential pressure gauge for the HEPA filters and the effluent flow measurement devices (i.e., flow indicators) will be calibrated annually. Response checks of the in-unit flow sensor and the flow indicator will be performed quarterly.

The need for additional in-place leak tests or instrument calibration and tests will be evaluated if there is reason to believe that an exhauster may have been damaged during a move or other event.

2.2 Use

The radiological source term that these exhasuters will be used to control is described in the second paragraph of Section 4.3.1.1 of DOE/RL-2011-03. The potential to emit (PTE) for these units is bounded by the PTE provided by Table 4-2, also in Section 4.3.1.1 of DOE/RL-2011-03.

These temporary exhaust units may be used individually or together in support of work within the scope of the RAWP. Their main use would be to support demolition preparation work activities, but could be used for specific localized ventilation during demolition, or other related RAWP work scope.

Examples of their use includes but is not limited to:

- supplementing the existing ventilation system,
- replacing the existing ventilation system,
- providing ventilation for local areas of the buildings,
- providing ventilation during removal of final filters from 234-5Z filter rooms,
- providing ventilation during clean out of 291Z,
- providing ventilation during characterization for slab removal,
- providing ventilation during slab removal activities,

- supporting waste packaging or size reduction and
- other work activities that must be completed after the 234-5Z and 291Z buildings ventilation system is shutdown.

The operating range for these temporary exhausters is 510 cubic meters per minute (18,000 cubic feet per minute) maximum and 102 cubic meters per minute (3,600 cubic feet per minute) minimum based on filter flow rating of 42.5 cubic meters per minute (1,500 cubic feet per minute). The 510 m^3/m (18,000 cfm) will be used as the exhaust flow rate for the purpose of estimating emissions. The actual flow rate will be recorded on the IONEX Usage Data Sheet(s) to confirm that the flow rate is less than 510 m^3/m (18,000 cfm). This will add conservatism to the emissions estimate to ensure emissions are not under estimated.

IONEX

MODEL 7559 PORTABLE EXHAUST VENTILATION AND HEPA FILTRATION SYSTEM
SPECIFICATION

Flow Configuration	Prefilter bank/HEPA filter bank/fan-motor
Reference Sketch	D7559
Mounting	Entire system is skid-mounted on structural base, suitable for transport with forklift.
Nominal Flow Rate	20,000 CFM

Total Fan Capacity with VFD @ 100% (each filter)

Static Pressure	Flow @ sea level
2.0" W.G.	25,290
4.0" W.G.	23,605
6.0" W.G.	21,760
7.0" W.G.	20,685
8.0" W.G.	19,515
9.0" W.G.	18,025

System Particle Removal Efficiency	99.97% minimum on 0.3 micron particles
Materials of Construction	Filter housing (11 ga.), housing base (11 ga.), and filter mounting and clamping components – stainless steel, type 304L Fan housing and wheel – painted carbon steel Prefilter cell sides – fiberboard HEPA cell sides – galvanized steel
Prefilter Type	Extended media, dry-type, mini-pleat
Prefilter Efficiency	80-85% ASHRAE
Prefilter Size	24" x 24" x 4"

MODEL 7559 PORTABLE FILTRATION SYSTEM

www.ionexres.com
P.O. BOX 70
LAFAYETTE, COLORADO 80026
303.666.5550
Fax: 303.666.5560

Figure 2. IONEX Model 7559 Specification Sheet Page 1

IONEX

Prefilter Change-out Method	Prefilter elements may be removed using conventional bag-out methods using prefilter disposal bags
HEPA Filter Type	ASME AG-1 Designation 7, 1500 CFM High-capacity (1500 CFM) HEPA filters are used to achieve high system capacity with fewer HEPA filter elements
HEPA Filter Size	24" x 24" x 11 ½"
HEPA Sealing Method	Closed cell sponge neoprene rubber or silicone rubber on upstream cell flange.
HEPA change-out Method	HEPA filter elements may be removed using conventional bag-out methods using HEPA filter disposal bags.
Fan Type	Heavy-duty backward inclined wheel, arrangement 4, direct drive, galvanized backdraft damper on fan outlet
Electrical Supply	480 volt, 3 phase, 60 Hz
Motor	40 Hp TEFC, premium efficiency, 1750 RPM
Flow Control	Fully adjustable using integral variable speed motor drive
Inlet Size	4 each 18" diameter flexible duct connections on each filter unit, 4 tight seal blank-offs provided
Outlet Size	1 – 34" x 34" vertical discharge with flanged connection (screened rain hood provided)
Overall Size, each Housing	164" long x 110" wide x 137" high (includes rain hood)
Operational Suitability	Outdoor operation, fully weather proof
Noise Level	Approximately 75 dBA at 3 feet distance with inlet and outlet connecting to ducting. (Fan and motor enclosed in sound/weather enclosure.)

MODEL 7559 PORTABLE FILTRATION SYSTEM

IONEX

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Figure 2. IONEX Model 7559 Specification Sheet Page 2

Controls	Differential pressure indicators across each bank of filter elements to monitor dust loading Flow monitoring element at inlet of fan with local flow indicator. Variable speed motor drive mounted in NEMA 3R enclosure.
Testing	Injection and sampling ports provided to permit periodic in-place HEPA filter testing. Separate sample probes provided for upstream and downstream sampling of each HEPA filter.
Sample Ports	Two capped sample ports provided downstream of fan for future installation of isokinetic sampling system by others
General Design Standard	ASME AG-1, ASME N-509
Quality Assurance	ASME NQA-1 Testing per ASME N-510

IONEX

Figure 2. IONEX Model 7559 Specification Sheet Page 3

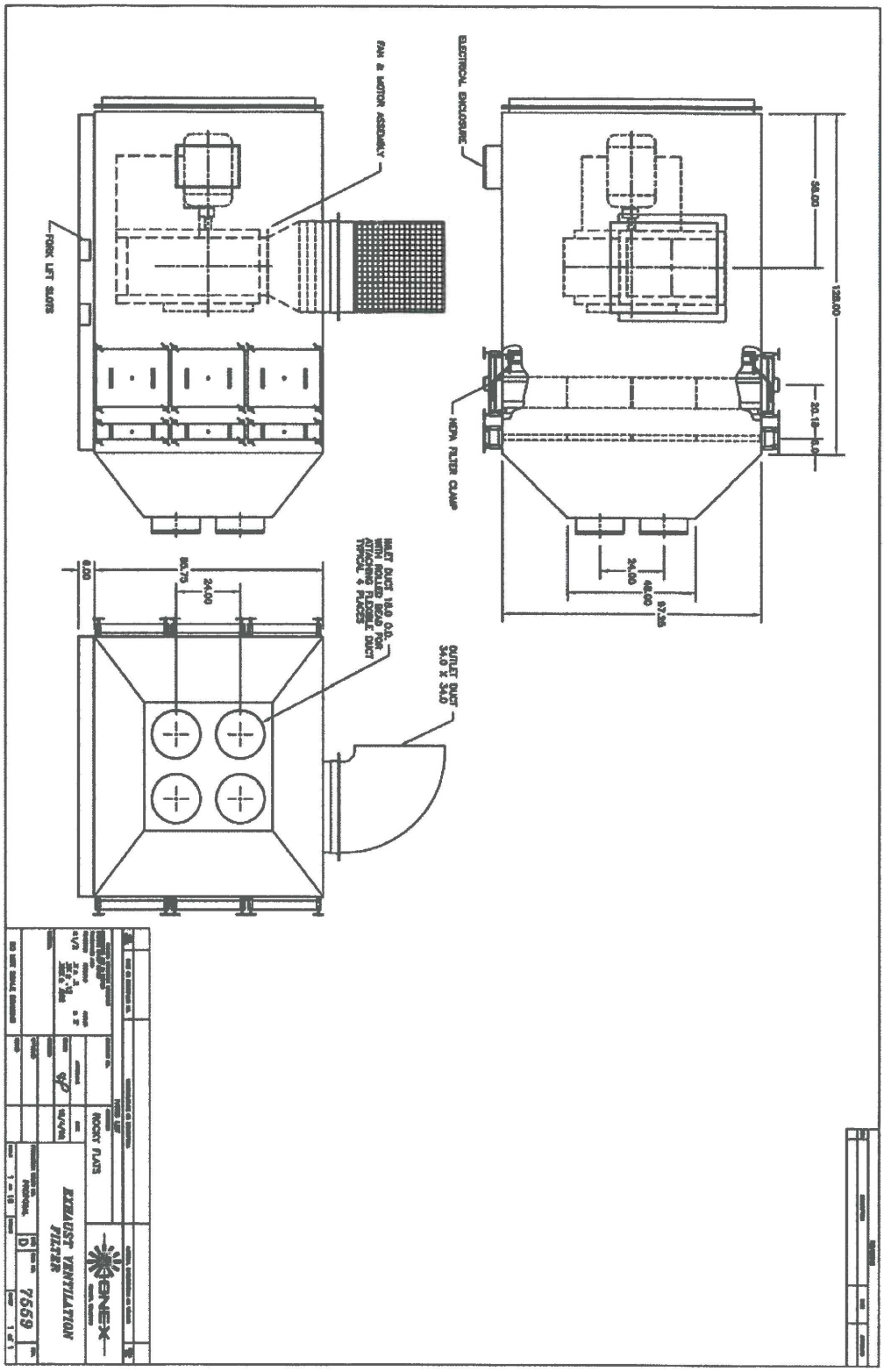

Figure 2. IONEX Model 7559 Specification Sheet Page 4

3 Proposed Sampling Method

The IONEX units do not have exhaust stacks and it is therefore impractical to meet the sample site selection and extraction criteria referenced by 40 CFR 61.93. Therefore in accordance with 40 CFR 61.93(b)(3) an alternate sampling method is being proposed.

The sampling for these units will be handled similarly to a Portable Temporary Radioactive Air Emissions Unit. The exhaust points from the HEPA filters will be monitored on a routine basis for potential radionuclide releases. This will be accomplished by utilizing a fixed head sampler with the sample head positioned to monitor the effluent stream. An evaluation will be conducted to determine the appropriate sample head location and sample flow rate prior to use of the temporary exhausters.

When one of the temporary exhaust units is in use, the associated sampler will be in operation. These exhausters may be used intermittently or continuously. In order to facilitate emissions calculations, a data sheet will be required to track usage of the exhausters. An example data sheet is provided below.

IONEX USAGE DATA SHEET

Unit Identification, Select one: ☐ IONEX 1, SN 906037-01; ☐ IONEX 2, SN 906062-01

Operator ensure sampler is started and stopped at the same time as the temporary exhauster

Operator Name (Print First and Last)	Start Date and Time	Sampler On?	Operating Flow Rate (cfm)	Stop Date and Time	Sampler Off?	Total Hours of Operation (Nearest Whole Hour)	Comments (Abnormal Conditions, Sample Paper Changeout, Location, etc.)

The information from the data sheet will be used to estimate emissions by determining the concentration of the sample volume and then applying that concentration to the exhaust flow rate of 510 m^3/m (18,000 cfm).

Assumptions for estimating emissions:

1. The fixed head sampler will have an air flow rate of 2 ft^3/min.
2. Sample media (filter paper) will be exchanged monthly if the exhauster has been operated at least 200 hours since the last exchange.
3. Emissions will be calculated with each filter changeout. Sample media will be analyzed for total alpha activity.
4. The exhauster flow rate will be assumed to be 18,000 ft^3/min.

Example calculation:

Run time between filter paper change out:	336 hours
Total alpha activity from the sample:	4.2 E-16 Ci
Sample volume:	2 ft^3/min*60 min/hr *336 hr = 4.03E04 ft^3.
Sample activity (analytical result):	= 4.2E-16 Ci
Sample activity concentration (activity/sample volume):	= 4.2E-16 Ci/4.03E04 ft^3 = 1.04E-12 Ci/ft^3
Exhaust flow volume for sampling period:	18,000 ft^3/min *60 min/hr*336 hr = 3.63E08 ft^3
Emissions estimate:	activity concentration *exhaust flow volume = 1.04E-12 Ci/ft^3*3.63E08 ft^3 = 2.86E-05Ci

As an alternative to use of a fixed head sampler to monitor emissions, the exhauster may be configured to discharge via the existing main stack and utilize the continuous stack monitoring system associated with that stack.

Notification will be provided to Ecology prior to initial use of the exhauster(s) under the provisions of this addendum. Notification will also be provided prior to final shutdown of the main ventilation system fans. Copies of data sheets will be provided to Ecology upon request.

4 References

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